# CONCEPTUAL FRAMEWORK FOR VIDEO BASED LEARNING EMBEDDED WITH COGNITIVE CONFLICT STRATEGIES TO REDUCE STUDENT'S MISCONCEPTION

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## 1.1 INTRODUCTION

New technologies, such as computer-based, are able to bring a wonderful and interesting experience in teaching and learning which benefits both the teacher as well as the students. Multimedia learning tools were introduced to enhance teaching techniques in order to encourage student learning. This includes any media that can be used in teaching instruction. Multimedia learning tools that integrate with text, graphics, audio, video and animation make for a more interesting experience and easier understanding of a concept (Ismail Zain, 2003).

Other than that, using video as a learning material has been employed in many ways for many years to support student learning. Although the use of learning videos has been widely employed in the past years, recently the interest has been incrementally increased (Giannakos, 2013) due to the video sharing sites like YouTube, Vimeo,

and TeacherTube. Since its launch in 2005, YouTube has become one of the popular free video-sharing website because it enables user to create, upload, and share their video (D. Y. Lee & Lehto, 2013). The free video-sharing website for user-created content (UCC) or user-generated content (UGC) has led to greater access and easy reach ability to a wide variety of learning materials (Chan, Choo, & Woods, 2013; Chtouki, Harroud, Khalidi, & Bennani, 2012; D. Y. Lee & Lehto, 2013).

In short, students need up-to-date learning and teaching styles that can nurture them towards creativity and innovation in line with the modernization era. Thus, video based learning environments can help to stimulate students to explore what they have learned in a more interesting approach. Therefore, it is undeniable that video brings many advantages. It can be said that this approach is both a wonderful and motivating; a learning material that is very suitable for the processes of teaching and learning today.

## 1.2 VIDEO BASED LEARNING

Digital video is an exciting emerging technology that can be used in learning to support, extend, or change pedagogy and curriculum outcomes. Video has been used in different ways for many years to support student learning in all branches of education (Barbara et. al, 2010). There are also numerous videos that have been specifically made for educational purposes, made by academics themselves.

There is a lot of research that highlight the tendency of educators uses the video to support students' understanding in learning process. With respect to subject area, Giannakos, (2013) explain in his finding that the language domain is dominant in video-based learning research. However, interest in the domains of information and communication technology (ICT) increased in the second period (2007 – 2012) under his investigation. Almost half the studies in Kay, (2012) review (n = 22)

examined cognitive attitudes toward video podcasts and over 85% of the findings were positive. Students thought video based learning were useful, helpful, and effective with respect to improving the learning process.

However, how the video should be used in learning and what actually the best framework that effect learners performance is still an ongoing question.

## 1.3 FLIPPED CLASSROOM APPROACH

Based on research by (Norah, Nurul 'Izzati, & Radhiah, 2013) found that visual learners prefer using the video before the class, which it is called as a flip classroom approach. The strategy of 'flip classroom', in which the lectures are moved from inside class to outside class (Demetry, 2010),. is a pedagogical model in which the typical lecture and homework elements of a course are reversed. Short video lectures are viewed by students at home before the class session, while in-class time is devoted to exercises, projects, or discussions. The use of video like putting lectures under the control of the students: they can watch, rewind, and fast-forward as needed. It seems to be resulting in increase active learning and student engagement (Stone, 2012), increase students motivation in learning (Butt, 2014) as well as a promising performance (Findlay-thompson & Mombourquette, 2014; Tune, Sturek, & Basile, 2013).

According to Findlay-thompson & Mombourquette, (2014) viewing the recorded videos outside class time are not enough to make the flipped classroom model successful. Rather, it is how teachers integrate these instructional videos into an overall approach that makes the difference.

## 1.4 MISCONCEPTION IN LEARNING

For the past 40 years, many researchers have studied students' misconceptions in various topics of education. Conceptually, misconceptions occur when students misinterpret concepts learned in the classroom (Gilbert et al., 1982; Skelly & Hall, 1993; Johnstone, 2000). In other words, students' conceptions of scientific issues are often not in line with the accepted scientific thinking. Worse than this, students' preconceptions are hard to change because their biases are not just mistakes or false beliefs, but are retained as their own cognitive thought and they defend against the truth (Driver, 1994).

## 1.5 CONCEPTUAL CHANGE

Conceptual change is different than knowledge acquisition because the former occurs if there exists a prior knowledge and the person who has misconceived this certain type of knowledge is aware of his or her misconception and is willing to evolve his or her understanding towards a correct conceptualization(Kabaca, Karadag, & Aktumen, 2011).

(Posner, Strike, Hewson, & Gertzog, 1982) had developed a conceptual change model and it explains a process where a learner changes his/her conceptions by assimilating or accommodating the existing schemas. The conceptual change model suggests that a necessary term of conceptual change is that the pupils have to be dissatisfied with the conceptions they are presently taking. It is less likely for a pupil who is satisfied with their current conception to accept a new conception that conflicts with the current one.

Another way to think about this is to regard existing knowledge as "capturing" new knowledge (Hewson, 1981). Conceptual change means replacing misconceptions with correct conceptions. One perspective on the issue is that teaching causes learning; if no learning occurs, then you couldn't have been teaching. Possible consequences of this are a blurring of the distinction between teaching and learning. Some teachers use the terms interchangeably or in combination, for example

when a focus on teaching strategies at the expense of learning activities because of the implied assumption that "if I taught well, my students will have learned what I wanted them to."

Hewson (1981) did mention the two major parts of the conceptual change model as followings;

i. A set of conditions which define the status of the concept that need to be satisfied in order for an individual to experience conceptual change.
ii. A person's conceptual environment that provides the framework in which the conceptual change happens, influences the change process, and yields a substance to the alteration itself.

To explain more about the conditions, Hewson and Thorley (1989) stated the conditions as follows;

i. Is the conception intelligible (meaningful) to the learner? That is, does the learner know what it stands for?
ii. Is the conception plausible (truthful) to the learner? That is, if the learner also believes that it is genuine?
iii. Is the conception fruitful (useful) for the learner? That is, if a conception achieves something of value for the learner? Does it solve otherwise insoluble problems? Does it suggest new possibilities, directions, and ideas?

To trigger the conceptual change process, cognitive conflict strategies can be used. The Conceptual Change Model proposed by Posner et al., (1982) and Hewson & Hewson (1984) is one of the most widely accepted and influential theories containing underlying Cognitive Conflict teaching strategies. Based on the works of Chan *et al.*, (1997), Limon (2001), and Strike and Posner (1985), implementation of Cognitive Conflict Strategies to foster conceptual change is based on the following four key elements which are as follows:

i. Making students aware of their existing concepts before instructional intervention,
ii. Confronting them with contradictory information,

iii. Using anomalous data or discrepant events to replace prior concepts with scientifically accepted ones, and
iv. Measuring the resulting conceptual change.

## 1.6 COGNITIVE CONFLICT SRATEGY

There is much researches related to Cognitive Conflict Strategies in science and mathematics education that has been proven to improve student performance and misconception. Lee & Kwon, 2001 state that cognitive conflict process occurs when a student experience three activities; (i) recognizes an anomalous situation, (ii) express interest or anxiety about breaking up the cognitive difference, and (iii) engages in cognitive reappraisal of the situation.

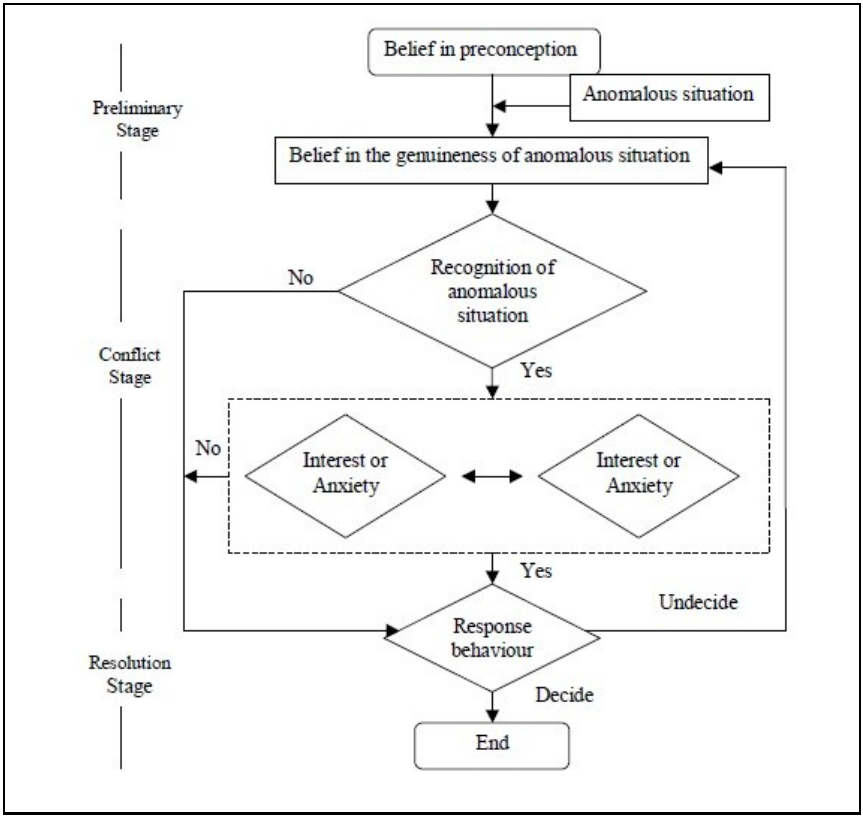


**Figure 1** Cognitive Conflict Process Model (Lee & Kwon, 2001)

A pupil first recognizes that the anomalous situation is inconsistent with their concept and then the student would be interested in or anxious around this state of affairs will reappraise the cognitive conflict situation and decides to resolve or ignore it.

The Cognitive Conflict Strategy can be believed to be beneficially employed when developing multimedia learning material. Even so, which elements of Cognitive Conflict Strategies that are usable within the video is still an ongoing inquiry. Radhiah, Norah, & Norasykin, (2014) had done a meta-analysis to investigate the elements of Cognitive Conflict Strategies that could be embedded within a video to effectively reduce the students' misconceptions based on details literature. They used the

following key words to search for related publications: misconception in learning, cognitive conflict strategies, conceptual change process and multimedia learning material. Literature was conduct via Science Direct, Web of Science, ProQuest and IEEExplore Digital Library. They identify five elements of Cognitive Conflict Strategy, which are (1) Meaningful information, (2) Challenges student's existing concept, (3) Able to gain attention, (4) Motivation, and (5) Comfortable while using it that need to be considered when developing multimedia learning as showni the following table.

Table 1. Literatures on the elements of cognitive conflict strategy

| No. | Element of Cognitive Conflict Strategy | Description | Study |
|---|---|---|---|
| 1 | Meaningful information | Learning materials should have high efficacy for giving clear concept to students. | (G. Lee et al., 2003; Mustafa Başer, 2006; Nilsson & Castro, 2013) |
| | | Capability to introduce contradictory information to induce cognitive conflict. | (S. Kang, Scharmann, & Noh, 2004; G. Lee et al., 2003) |
| 2 | Challenging students' existing concept | Identify students' current state of knowledge. | (S. Kang et al., 2004; Mustafa Başer, 2006) |
| | | Focus on condition that promotes a situation where the existing concept can be explicit. | (Baddock & Bucat, 2008; Kabaca et al., 2011; S. Kang et al., 2004) |
| 3 | Ability to gain attention | Provide situational interest by identifying students' characteristics. | (Baddock & Bucat, 2008; H. Kang, Scharmann, Kang, & Noh, 2010; Nilsson & Castro, 2013) |

| | | | |
|---|---|---|---|
| 4 | Motivation | Provide situation that makes students feel curious about the topic to motivate learning process. | (Kabaca et al., 2011; G. Lee et al., 2003) |
| 5 | Comfortability in using the multimedia learning materials | Provide the ideas that are able to bring cognitive conflict to become lighter. | (Baddock & Bucat, 2008) |

These five elements of Cognitive Conflict Strategies as shown in Table 1 should be consider to be applied when developing multimedia learning material in order to overcome the misconception.

## 1.7 CONCEPTUAL FRAMEWORK

Using video to present scientific concepts in a clear, well-illustrated way might cause students to believe they are learning, but they do not engage with the media on a deep enough level to realize that what was presented differs from their prior knowledge. This might cause by misconception where students have understood certain concepts in the wrong way. As discussed earlier, many studies have identified that Cognitive Conflict Strategies can be adapted in a learning environment to reduce the misconception by enhancing student conceptual change process. For this purpose, video can take full advantage of the learning practice and raise the effectiveness and quality of learning itself (Somekh and Davies, 1991). With that in mind, videos for learning embedded with elements of Cognitive Conflict Strategies, can give a lot of benefits to the education field.

Designing videos can engage all the learning aspects; cognitive, affective and psychomotor, which helps students' learning. For that reason Cognitive Conflict are preferable strategies for encouraging students to enhance their mental framework. These strategies can help

students to go forward with a correct concept in mind and allow them to avoid more misconceptions occurring during the learning process. Donn(1989) reported, students like using a meaningful learning strategy when reacting to novel problems with self-questioning and by relating and elaborating ideas. (An-Andy, 1987) claimed that a drama video can provide a meaningful learning strategy because they are able to be watched, heard, thought and felt at the same time when student watched them This means that the effectiveness of a combination of Cognitive Conflict Strategies along with the worthwhile benefits of video may lead to a more meaningful student learning process.

In addition, the benefits of video in learning and flipped classroom approach are merged together to foster student performance. Nowadays, students like to gain knowledge via video because from their viewpoint, concentrating on short lecture videos at home is easier than listening to an hour long talk in a lecture hall (Chui and Greg; 2009). For that, flipped classroom approach is a suitable to be applied in learning. The summary based on Figure 1.

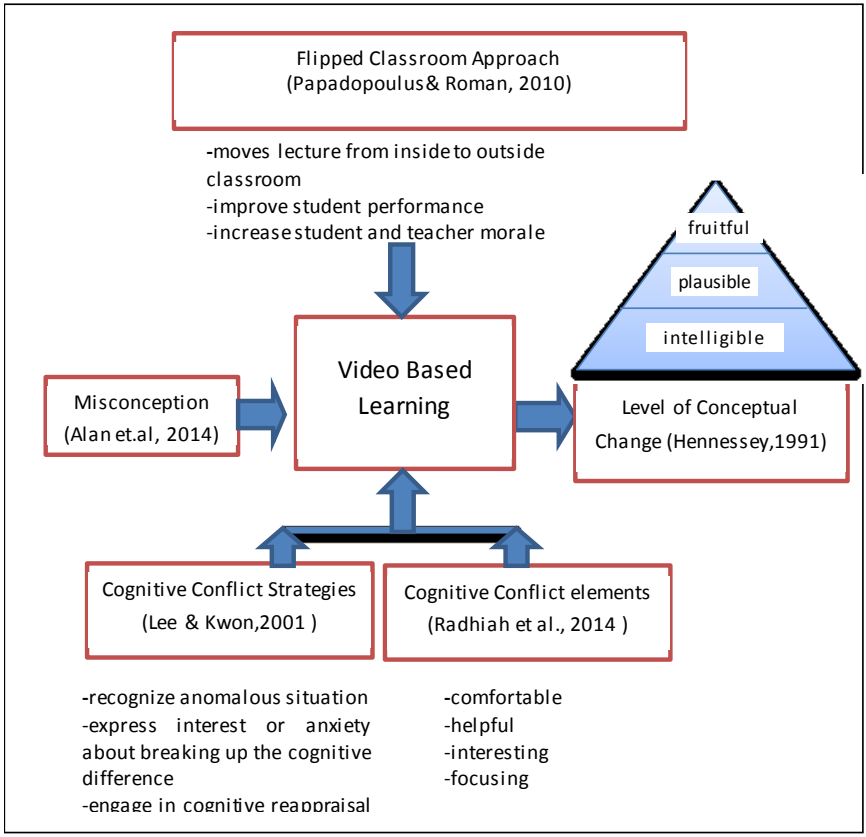


Figure 2 : The proposed conceptual framework

So, expectedly, the learning video embedded within Cognitive Conflict Strategies is developed to make students feel anxious and start the response in the conceptual change process. As a result, the students' concept will be corrected after they are engaged in cognitive reappraisal of the situation and reduce their misconception. This can give implication on increasing student performance.

## 1.8 CONCLUSION

This research is planned in order to develop a video based learning that

can help to encourage a positive conceptual change among students. The literature suggests that the video should be embedded with cognitive conflict strategy as it had been claimed to improve students' misconception. Besides, the flipped classroom approach should be used as it has shown many positive outcomes among learners. Hopefully, the development of video based learning as shown in the conceptual framework can really help to foster student conceptual change process by reducing their misconceptions. If the finding is positive, this study will become another success story on using multimedia, especially video that will improve the quality of education nationwide.

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